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GEOPHYSICAL VARIABLES AND BEHAVIOR: LXVII. QUIETER ANNUAL GEOMAGNETIC ACTIVITY AND LARGER EFFECT SIZE FOR EXPERIMENTAL PSI (ESP) STUDIES OVER SIX DECADES[1]

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Summary.—Standardized measures (relative effect size) were calculated for all experiments published between the years 1882 and 1939 that concerned putative telepathy. During this period the magnitude of the phenomenon was greatest when the geomagnetic activity was lowest during the previous year (when most of the experiments would have occurred); the strengths of the correlations were between −.40 and −.60. The effect was similar in both direction and magnitude to several studies, involving both experimental and subjective data (1867 through 1980) and suggesting an enhancement of this specific type of anomalous phenomenon during periods of quiet geomagnetic activity.

Putative telepathic-clairvoyant experiences may be considered anomalous perceptual phenomena that still involve responses to stimuli. These stimuli do not appear to access usual sensory modalities but may directly stimulate neurocognitive processes. Roll (1989) has suggested that memory itself is the receptive organ for these "psi" experiences. Persinger (1989) has hypothesized that alterations in limbic (primarily hippocampus-amygdala) lability facilitate psi experiences and that some neuropsychological factor associated with quiet geomagnetic activity promotes the processes involved.

The facilitation of telepathic-clairvoyant processes during periods of quiet geomagnetic activity has been indicated in both spontaneous and experimental settings. The Laurentian Neuroscience Group, in pursuit of understanding the role of temporal lobe lability in meaningful experiences, has analyzed three separate collections of cases and experiences that were reported to have occurred between the years 1868 and 1980. Spontaneous psi experiences concerning death and crises to significant others occurred on days in which the global geomagnetic activity was less than the days before or afterwards; this has been called the V-shape effect (Arango & Persinger, 1988; Persinger, 1987; Persinger & Schaut, 1988).

Subsequent analyses of the Maimonides experimental dream telepathy studies (Persinger & Krippner, 1990) indicated that the strongest correspondence between dream content and the target material occurred on nights when the global geomagnetic activity was significantly less than the preceding or succeeding days. In a single-subject experiment (Makarec & Persinger,

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1987), anomalous cognition of card patterns was facilitated during geomagnetically quiet days. Spottiswoode (1990) recently confirmed the geomagnetic effect in four major data sets from laboratory experiments (in which the psi effect was present) from major research groups; the statistically significant negative correlations were absent from those portions of the data sets in which there was no evidence of anomalous cognition.

If the proposed geomagnetic effect is generalizable and the basic processes that mediate experimental and spontaneous telepathy-clairvoyance are similar, then the results of traditional card-guessing experiments should be negatively correlated with geomagnetic activity. Between the years 1882 and 1939 a total of 185 experiments, primarily involving card guessing, were published; these results have been tabulated by Rhine, Pratt, Smith, Stuart, and Greenwood (1940). This data set was employed to test the hypothesis.

In all of these experiments, the presence of telepathy-clairvoyance was inferred by the statistical deviation from chance expectancy. Because probability levels are affected by degrees of freedom (or trials), we standardized the scores of each experiment by determining the effect size, defined as the z score divided by the square root of the number of trials. One-year intervals were selected as the increments of analyses; they were the smallest units (publication year) that could be discerned from the data.

A total of 35 separate years between 1882 and 1939 contained at least one experiment. Because some years contained only one experiment ($n = 11$ separate years) while others contained more than one experiment ($n = 24$), some representative index of effect size for each year was required. We selected the median size effect for all experiments that were published in the same year as our primary measure to attenuate the effects of extreme scores from single experiments; for comparison the experiment with the maximum and with the minimum of the effect size for each year was determined (separately) as well.

For each of the 35 years in which at least one experiment took place, the mean aa (antipodal) values (Mayaud, 1973) were determined for the year in which the experiment was published and for each of the 5 years before the publication; aa values are considered the most accurate indices of global geomagnetic activity (Bubenik & Fraser-Smith, 1977). Geomagnetic measures for the years before the publication were included because we assumed at least a one-year lag between the execution and publication of the experiments; this was done assuming that most of the researchers at that time were directly involved in the publication process.

Bivariate correlations were computed by SPSS^{x} software on a VAX 4000 computer among the three measures of effect size and the yearly aa values; both Pearson r and Spearman *rho* coefficients were calculated to assess the effects of outliers. To ensure that years in which only one experi-

ment (and hence only one effect size value) had been performed did not differentially affect the size of the correlations, separate analyses were completed for the two types of years.

The results indicated that years with the quietest geomagnetic activity were associated with the largest effect sizes for psi experiments. Lag correlations between the median effect size (all years and only years with more than one experiment, respectively) and aa values were in the same year −.28 and −.35, in the year before −.40 and −.56 ($p < .01$), 2 years before −0.30 and −0.35, and 3 years before .02 and .15. Fig. 1 shows the strongest correlations that occurred between the median effect size for the year of publication and the geomagnetic activity of the previous year (when most of the experiments would have been actually performed). Nonparametric and parametric coefficients were similar in magnitude for both nonlagged and lagged analyses.

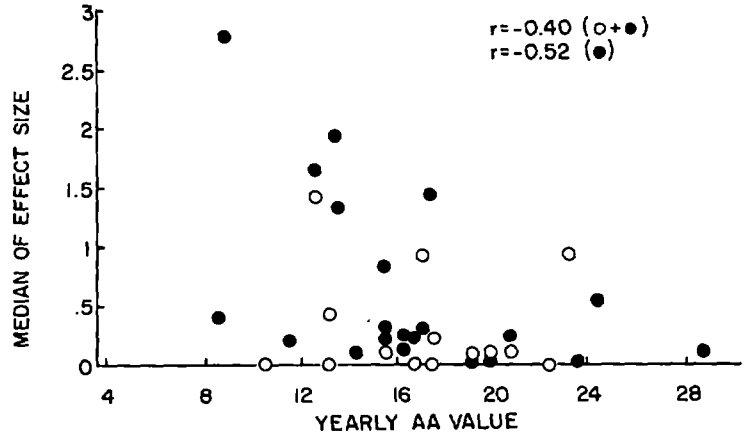

FIG. 1. Median values for the standardized magnitude (relative effect size) for guesses for all experimental telepathy studies per year and the mean annual geomagnetic activity of the previous year (embedded symbols indicate extremely marginal but negative effect sizes). Open circles refer to all years (35) while filled circles refer to only those years in which more than one study was published.

Correlations (*r* and *rho*, respectively) between aa values of the previous years were −.35 and −.37 for the maximum effect size and −.35 and −.37 for the mean effect size for all 35 years. For the 24 years in which there were more than one experiment these values were −.62, −.55, and −.60 and −.53, respectively ($p < .01$ for all correlations). The magnitudes of the coefficients were not altered when a partial correlation for temporal order was calculated, i.e., serial correlations of data for successive years did not affect the magnitudes of the coefficients. Results of lag/lead analyses (−3 to +3 years) that

potentially allowed any of the aa values from these seven years to enter the equation, verified that the year before publication was the only major source of variance for all years ($F_{1,29} = 7.21$, $p = .01$; $MR = .44$) and specific years in which more than one experiment had been published ($F_{1,19} = 7.46$, $p = .01$; $MR = 0.53$).

The results are compatible in both magnitude (*eta* value of about .40) and direction (negative) with previous studies. In three separate analyses of subjective experiences of putative telepathy-clairvoyance, the strength of the difference in aa values between days on which the experiences occurred compared to (1) previous days or (2) days on which other forms of psi experiences (e.g., postmortem apparitions) was equivalent to a coefficient of about −0.40. Two experimental studies, one with a single subject (Makarec & Persinger, 1987) and the other with 50 individuals who engaged in an experimental study of dream telepathy (Persinger & Krippner, 1989) also gave essentially equivalent coefficients with values between −.40 and −.50.

A similar effect strength between analyses that involve daily geomagnetic activity (all previous studies) and yearly geomagnetic activity is reconcilable if one assumes that yearly averages reflect the relative incidence of "quiet" geomagnetic days and that the experiments were randomly distributed over these days. Stated alternatively, it is not unusual for a phenomenonal set to reflect the characteristics of its subsets. In fact, Randall and Randall (1991) have recently reported an association between the annual intensity of geomagnetic activity and the annual incidence of apparitional phenomena; the effect was similar to that shown for daily occurrences and daily global geomagnetic activity (Persinger & Schaut, 1988). Although these results do not prove the validity of the phenomenon, they suggest that experimental and spontaneous psi experiences may be affected by a similar factor; it is coupled to low geomagnetic activity at the time of the putative stimulus presentation. The relationship between this factor and this form of psi phenomenon has been present for at least 100 years.

REFERENCES

ARANGO, M. A., & PERSINGER, M. A. (1988) Geophysical variables and behavior: LII. Decreased geomagnetic activity and spontaneous telepathic experiences from the Sidgwick collection. *Perceptual and Motor Skills*, 67, 907-910.

BUBENIK, D. M., & FRASER-SMITH, A. C. (1977) Evidence for strong artificial components in the equivalent linear amplitude geomagnetic indices. *Journal of Geophysical Research*, 82, 2875-2878.

MAKAREC, K., & PERSINGER, M. A. (1987) Geophysical variables and behavior: XLIII. Negative correlation between accuracy of card-guessing and geomagnetic activity: a case study. *Perceptual and Motor Skills*, 65, 105-106.

MAYAUD, P. N. (1973) A hundred-year series of geomagnetic data 1868—1967. *IAGA Bulletin*, No. 33.

PERSINGER, M. A. (1983) Religious and mystical experiences as artifacts of temporal lobe function: a general hypothesis. *Perceptual and Motor Skills*, 57, 1255-1262.

PERSINGER, M. A. (1987) Spontaneous telepathic experiences from Phantasms of the Living

and low global geomagnetic activity. *Journal of the American Society for Psychical Research*, 81, 23-36.

PERSINGER, M. A. (1989) Psi phenomena and temporal lobe activity: the geomagnetic factor. In L. A. Henkel & R. E. Berger (Eds.), *Research in parapsychology 1988*. Metuchen, NJ: Scarecrow Press. Pp. 121-156.

PERSINGER, M. A., & KRIPPNER, S. (1989) Dream ESP experiments and geomagnetic activity. *Journal of the American Society for Psychical Research*, 83, 101-116.

PERSINGER, M. A., & SCHAUT, G. B. (1988) Geomagnetic factors in subjective telepathic, precognitive and postmortem experiences. *Journal of the American Society for Psychical Research*, 82, 217-235.

RANDALL, W., & RANDALL, S. (1991) The solar wind and hallucinations—a possible relation to magnetic disturbances. *Bioelectromagnetics*, 12, 67-70.

RHINE, J. B., PRATT, J. G., SMITH, B. M., STUART, C. E., & GREENWOOD, J. A. (1940) *Extrasensory perception after 60 years: a critical appraisal of the research*. Boston, MA: Bruce Humphries.

ROLL, W. G. (1989) Memory and the long body. In L. A. Henkel & R. E. Berger (Eds.), *Research in parapsychology 1988* Metuchen, NJ: Scarecrow Press. Pp. 67-72.

SPOTTISWOODE, S. J. P. (1990) Geomagnetic activity and anomalous cognition: a preliminary report of new evidence. *Subtle Energies*, 1, 91-102.

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